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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,054	09/11/2003	Shigeru Yamane	MAT-8260US1	7291

23122 7590 01/28/2008

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EXAMINER	
CROUSE, BRETT ALAN	
ART UNIT	**PAPER NUMBER**
1794	

MAIL DATE	DELIVERY MODE
01/28/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/660,054	YAMANE ET AL.	
	Examiner	Art Unit	
	Brett A. Crouse	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *37,40,47,59,66,69,76 and 83-95* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *37,40,47,59,66,69,76 and 83-95* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the amendment, filed 18 October 2007, which amends claims 37 and 66, and adds new claims 88-95. Claims 37, 40, 47, 59, 66, 69, 76 and 83-95 are pending.

Response to Amendment

The rejections of:

claims 66, 69, 70, 76, 85 and 87 under 35 U.S.C. 102(b) as being anticipated by Gause et al., US 3,895,158 as evidenced by (Paper on Web, http://www.paperonweb.com/density.htm) and as evidenced by Yuhas et al., US 5,350,621;

and;

claims 66, 69, 70, 76, 85 and 87 under 35 U.S.C. 102(b) as being anticipated by Yuhas et al., US 5,350,621;

are overcome by the amendment.

The references are reapplied under 35 U.S.C. 103(a) as set forth below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 37, 40, 47, 66, 69, 76, 83, 85-88, 90, 92, 94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gause et al., US 3,895,158 hereinafter known as Gause in view of (Paper on Web, http://www.paperonweb.com/density.htm) and in view of Yuhas et al., US 5,350,621.

Gause teaches:

Column 3, lines 15-38, teach a laminate structure comprising resin impregnated cellulosic fiber paper layer(s), a nonwoven material, between resin impregnated woven glass fiber layers. The paper layers can be partially cured to the B-stage. Additionally, metal foils can be added to the outer woven glass fabric layers. The laminates can additionally be drilled and punched.

Column 4, lines 41-60, teach formation of the resin impregnated glass fabric layer(s). The layers are partially cured to a B-stage, thus teaching a semi-cured thermosetting resin.

Column 5, lines 25-30, teach that a resin rich surface can be provided upon the impregnated layer(s). This is held to teach a resin layer formed on the fiber sheet.

Column 7, line 39 through column 9, line 46, example 1 and Column 10, lines 1-9, example 3, teach as example 3 laminate structure, formed by the method of example 1, having paper layer(s) sandwiched between glass fabric layers in which identical resins are used in the paper layer(s) and glass fabric layer(s). This provides the structures of first, second and third layers of the claims with the two glass fabric layers acting as the first and second layers of claim 76.

Gauss does not teach:

Gauss does not recite the density of the individual layers.

Paper on Web provides the density of papers.

Yuhas et al., table 1, columns 3/4, provides the density of glass fabrics commonly used in printed wiring boards. The density of both materials overlaps applicant's claimed density range(s).

Yuhas et al., column 6, lines 43-65, teaches that various configurations are known in the art. The passage also teaches that it is usual practice not to mix more than three types of fabrics or resins.

Yuhas et al., column 7, lines 45-67, teach that various combinations of materials and resins are suitable in order to acheive the desired characteristics.

The references Paper on Web and Yuhas et al. teach various densities of paper and glass fabrics commonly used in the manufacture of printed wiring boards. Yuhas additionally teaches that various combinations of fabrics and resins can be selected to meet the needs of the manufacturer and that "the circuit laminates and the bonding sheets could in principle be comprised of any of the many possible laminate constructions." Therefore, it would have been obvious to one of ordinary skill in the art that a combination of the known materials having the densities ranges such as the densities ranges as taught in the prior art references used for the purpose of constructing a printed wiring board as taught in the prior art references would result in the successful manufacture of a printed wiring board having all the elements of the rejected claims.

Claims 37, 40, 47, 66, 69, 76, 83, 85-87 are rejected under 35 U.S.C. 103(a) as being unpatentable Yuhas et al., US 5,350,621 hereinafter known as Yuhas in view of (Paper on Web, http://www.paperonweb.com/density.htm).

Yuhas teaches:

Column 1, line 41 through column 2, line 2, teaches it is a purpose of the invention to provide a method for calculating the laminate coefficient of thermal expansion as a function of fiber volume to reduce the number of registration errors during the manufacture of printed wiring boards.

Column 3, lines 28-30, teach that the impregnated cloth can be B-staged. The prepreg can additionally be laid-up with at least one sheet of conductive metal.

Column 2, line 43 through column 3, line 12, teaches that the resin of the laminate can reinforced with various fibers. The passage also provides various examples of suitable thermoset resins.

Column 4, lines 33-39, table I, teach glass fabric styles commonly used in the art for multilayer laminates. Table I provides density data for the various styles. The densities range between 651 kg/m^3 for style 106 and 2825 kg/m^3 for style 7628.

Column 5, lines 37-59, table II, teaches eight preferred styles of glass fabric. The density of each of the styles is about 800 kg/m^3.

Column 6, lines 38-42, teach that the laminate can be provided with holes and the layers interconnected via the holes by plating with copper.

Column 6, lines 43-55, teach multilayer laminates for a printed circuit board which commonly can have up to three layers of different types of fabric. The laminate also

employs a bonding sheet to provide uniform thickness of the board. The bonding sheets additionally provide excess resin to fill in between the circuitry on the board. This is held to teach a resin layer on the fabric surface.

Column 7, lines 45-67, teach the multilayer boards are formed using a combination of the various fabric styles and resin contents.

Paper on Web provides the density of papers.

Yuhas does not teach:

Yuhas does not recite the density of the individual layers.

The references Paper on Web and Yuhas et al. teach various densities of paper and glass fabrics commonly used in the manufacture of printed wiring boards. Yuhas additionally teaches that various combinations of fabrics and resins can be selected to meet the needs of the manufacturer and that "the circuit laminates and the bonding sheets could in principle be comprised of any of the many possible laminate constructions." Therefore, it would have been obvious to one of ordinary skill in the art that a combination of the known materials having the density ranges such as the density ranges as taught in the prior art references used for the purpose of constructing a printed wiring board as taught in the prior art references would result in the successful manufacture of a printed wiring board having all the elements of the rejected claims.

Claims 37, 40, 47, 66, 69, 76, 83, 85-95 are rejected under 35 U.S.C. 103(a) as being unpatentable over of Kawakita et al., US 5,960,538 hereinafter known as Kawakita, in view of

Gause et al., US 3,895,158 hereinafter known as Gause and in view of (Paper on Web, http://www.paperonweb.com/density.htm) and in view of Yuhas et al., US 5,350,621

Kawakita teaches:

Column 3, lines 15-24, teach the fabric sheet is preferably a nonwoven fabric of synthetic fiber. The passage additionally teaches the sheet can be aramid.

Column 3, lines 27-60, teach a method of making a printed circuit board.

Column 3, line 61 through column 4, line 39, teach additional methods of making a circuit board.

Column 10, line 51 through column 14, line 65, examples 1-4, provide examples of circuit boards formed by the methods taught by Kawakita.

Kawakita does not teach:

Kawakita is silent with respect to the density of the aramid-epoxy sheet(s) used as the prepreg(s) of the examples. However, Kawakita provides multiple layer prepregs having at least three layers. (i.e. a first, second and third layer)

Gause teaches:

Column 3, lines 15-38, teach a laminate structure comprising resin impregnated cellulosic fiber paper layer(s) between resin impregnated woven glass fiber layers. The paper layers can be partially cured to the B-stage. Additionally, metal foils can be added to the outer woven glass fabric layers. The laminates can additionally be drilled and punched.

Column 4, lines 41-60, teach formation of the resin impregnated glass fabric layer(s). The layers are partially cured to a B-stage, thus teaching a semi-cured thermosetting resin.

Column 5, lines 25-30, teach that a resin rich surface can be provided upon the impregnated layer(s). This is held to teach a resin layer formed on the fiber sheet.

Column 7, line 39 through column 9, line 46, example 1 and Column 10, lines 1-9, example 3, teach as example 3 laminate structure, formed by the method of example 1, having paper layer(s) sandwiched between glass fabric layers in which identical resins are used in the paper layer(s) and glass fabric layer(s). This provides the structures of first, second and third layers of the claims with the two glass fabric layers acting as the first and second layers of claim 47.

Paper on Web provides the density of papers.

Yuhas et al., table 1, columns 3/4, provides the density of glass fabrics commonly used in printed wiring boards. The density of both materials overlaps applicant's claimed density range(s).

Yuhas et al., column 6, lines 43-65, teaches that various configurations are known in the art. The passage also teaches that it is usual practice not to mix more than three types of fabrics or resins.

Yuhas et al., column 7, lines 45-67, teach that various combinations of materials and resins are suitable in order to achieve the desired characteristics.

Gause teaches that it is the intent of his invention to provide a laminate for use in printed circuit boards, which is suitable for drilling and punching to create holes suitable for plating. It would be obvious to one of ordinary skill in the art to use for its intended

purpose the laminate of Gause as the prepreg material in the process of Kawakita to produce a printed circuit board.

Yuhas teaches that various combinations of fabrics and resins can be selected to meet the needs of the manufacturer and that "the circuit laminates and the bonding sheets could in principle be comprised of any of the many possible laminate constructions." Therefore, it would have been obvious to one of ordinary skill in the art that a combination of the known materials having various density ranges such as the density ranges as taught in the prior art references used for the purpose of constructing a printed wiring board as taught in the prior art references would result in the successful manufacture of a printed wiring board having all the elements of the rejected claims.

Claims 59 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakita et al., US 5,960,538 hereinafter known as Kawakita, in view of Gause et al., US 3,895,158 hereinafter known as Gause in view of (Paper on Web, http://www.paperonweb.com/density.htm) and in view of (Yuhas et al., US 5,350,621) as applied to claims 37, 40, 47, 66, 69, 76 and 83, 85-95 above, and further in view of Nakatani et al., US 6,096,411 hereinafter known as Nakatani.

The teachings of Kawakita in view of Gause/Paper on Web/Yuhas as in the rejection above are relied upon.

Kawakita in view of Gause/Paper on Web/Yuhas does not teach:

Kawakita in view of Gause/Paper on Web/Yuhas does not recite non-spherical conductive particles as a component of the conductive paste. Conductive particles are taught generally, however only spherical particles are used in the examples.

Nakatani teaches:

> Column 2, lines 33-67, teach a conductive paste for filling inner via holes of a printed circuit board comprising a mixture of fine-grained copper particles and coarse grained insulating particles. The passage further teaches that it the paste provides low viscosity, low volatility, and high continuous printability.
>
> Column 4, lines 34-35, teach the copper particles can be spherical or non-spherical in shape, for example flakes.
>
> It is prima facie obvious that non-spherical conductive particles can be used in the conductive paste of Kawakita with the expectation that the resulting conductive paste will perform suitably as a via hole filler in a printed circuit board.

Claims 88-95 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yuhas et al., US 5,350,621 hereinafter known as Yuhas in view of Paper on Web, as applied to claims 37, 40, 47, 66, 69, 76, 83, 85-87 above, and further in view of Kawakita et al., US 5,960,538 hereinafter known as Kawakita.

The teachings of Yuhas and Kawakita as in the rejections above are relied upon.

Yuhas does not teach:

Yuhas does not teach a conductive paste, with or without conductive particles, used to fill via holes to provide electrical connection between layers. Yuhas does teach laminating a prepreg to copper cladding, providing via holes and plating the via holes to electrically interconnect the layers.

Kawakita teaches:

Column 3, lines 27-60, teach a method of making a printed circuit board.

Column 3, line 61 through column 4, line 39, teach additional methods of making a circuit board.

It would have been obvious to one of ordinary skill in the art to employ the known method steps of Kawakita to provide a circuit board of Yuhas with an expectation of successfully forming a serviceable circuit board.

Claims 59 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yuhas et al., US 5,350,621 hereinafter known as Yuhas in view of Paper on Web, as applied to claims 37, 40, 47, 66, 69, 76, 83, 85-87 above, and further in view of Nakatani et al., US 6,096,411 hereinafter known as Nakatani.

The teachings of Yuhas in view of Kawakita as in the rejection above are relied upon. Yuhas in view of Kawakita does not teach:

Yuhas in view of Kawakita does not recite non-spherical conductive particles as a component of the conductive paste. Conductive particles are taught generally, however only spherical particles are used in the examples.

Nakatani teaches:

Column 2, lines 33-67, teach a conductive paste for filling inner via holes of a printed circuit board comprising a mixture of fine-grained copper particles and coarse grained insulating particles. The passage further teaches that it the paste provides low viscosity, low volatility, and high continuous printability.

Column 4, lines 34-35, teach the copper particles can be spherical or non-spherical in shape, for example flakes.

It is prima facie obvious that non-spherical conductive particles can be used in the conductive paste of Kawakita with the expectation that the resulting conductive paste will perform suitably as a via hole filler in a printed circuit board.

Response to Arguments

With respect to the rejections of the office action, mailed 2 August 2007, applicant argues that the references do not teach a fiber sheet having a layer of lower density between two layers of higher density in all cases because of the overlap of material densities reported in the Paper on Web and Yuhas et al. references. The rejections under 35 U.S.C. 102 have been withdrawn and the reference reapplied under 35 U.S.C. 103. The references teach ranges of densities that result in a layer of lower density between two layers of higher density. The references also teach that combinations of the materials having different densities is known and commonly used by those of ordinary skill in the art.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brett A. Crouse whose telephone number is 571-272-6494. The examiner can normally be reached Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terell H. Morris can be reached on 571-272-1478. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BAC/ 12 January 2008

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